

Compliance Evaluation Inspection (CEI)
Cumberland City Lagoon Wastewater Treatment System
NPDES Permit # TN0025119, Stewart County

On September 23, 2011, I conducted a Compliance Evaluation Inspection of the Cumberland City Lagoon wastewater treatment system. I met with City Recorder Cheryl Milliken and Danny Baggett, assistant operator, who provided assistance during the inspection. Mayor Gary Vaughn also stopped by the treatment facility during the inspection. On September 26th, I contacted Director of Public Works Mike Perrigo by telephone to obtain more information. I also spoke with the Phillip Baggett by telephone on September 28th and again on October 19th. Mr. Baggett, Water and Wastewater Superintendent for the City of Erin, serves as the certified operator for the wastewater treatment facility. On October 20th, I spoke with Ricky Eads, certified operator for the City of Erin, who conducts the sampling and analysis for some of the self-monitoring parameters.

The following information and observations were obtained during the inspection, from the system personnel, or from file review.

The system consists of cominutor/barscreen, and a two stage lagoon, with liquid chlorine bleach used for disinfection. The primary lagoon has surface aerators. The system design capacity is 85,000 gallons per day, and discharge is to the Cumberland River within Barkley Lake. The system currently serves 115 active sewer taps.

Collection System

The collection system contains three pump stations, with all wastewater flow passing through the main pump station to enter the lagoon. Wastewater passes through the other two stations in succession before flow reaches the main pump station.

1. There was an original set of engineering plans on hand showing the sewer collection system as of 1969, and it was believed that no additional lines have been installed since the system was constructed. All of the pages of the plans were torn and in very bad condition. An up to date map of the collection system should be developed for use in locating lines, manholes, and connections.
2. Pumps and control panels at each of the pump stations that were damaged during the 2010 flood have been replaced using FEMA flood recovery funding.
3. The system consists of almost all original clay sewer lines and manhole structures of brick or other construction which are in poor condition. There are severe problems with inflow and infiltration (I/I) of extraneous water during rain events and wet weather. A table summarizing rainfall data and effluent flow data for 2011 is attached. Maximum flows reached as high as 403,000 gallons per day during two days in April. This is 4.7 times the design capacity of the treatment system.

4. City personnel were not aware of any overflows within the system due to I/I, but expressed concerns that all flow entering the collection system may not get to the lagoon for treatment.
5. Mayor Vaughn mentioned that discussions have occurred about funding possibilities for sewer rehabilitation projects. The city has not yet applied for any funding or prepared any engineering plans for rehabilitation projects. Because of the condition of the old clay lines and the documented flow increases due to I/I, sewer rehabilitation and replacement of clay lines should be considered a priority item that must be addressed.
6. There were severe septic odor problems at the lagoon when the main pump station came on and flow entered the influent structure. The pump stations are already set to begin pumping when wastewater reaches the two foot level in the wet wells. If the pump stations can't be further adjusted to pump more frequently to reduce septic odors, some type of odor control chemicals may be needed to combat the problems.
7. The permit requires the collection system be operated under the supervision of a certified collection system operator. For the Cumberland City system a Grade 1 collection system certification would be required. The city does not have an employee certified for collection system operation or anyone contracted to provide these services. Arrangements must be made to have someone with the appropriate certification be in direct responsible charge of the operations of the collection system. Training classes and information about application and exams for operator certification are provided by the state's Fleming Training Center (615-898-8090) located in Murfreesboro. The Training Center should be contacted if someone with the city is planning to obtain training for certification. A contract collection system operator must be hired until city personnel become certified.

Operation and Maintenance

1. Phillip Baggett, the contract certified wastewater treatment system operator, visits the treatment lagoon several times per week to check on conditions at the lagoon and also provides technical assistance. Mr. Perrigo does all the day to day operation of the system.
2. The facility and grounds are fenced. The fencing at several places has been damaged during mowing or other activities around the facility, and there are gaps under the bottom of the fence at some points. One very long section along one side has several posts leaning or broken loose. New posts and supplies were already on hand but the repairs had not been started. The access gate is also damaged and bent. The gate was locked in such a way that the chain could be removed from the top of the center post and the gate pushed open. The fence should be repaired and maintained to secure the facility to prevent unauthorized access, for public safety and security purposes. Since the inspection, the certified operator has been provided with a key to the gate so that the

locking arrangement can be changed. The lab building door was not unlocked. The building should be locked for safety and security reasons.

3. A large amount of rock and gravel deposits were observed in the influent structure. The material has entered through the collection system and appears to be an ongoing problem. This indicates broken sewer lines, and/or open or damaged manhole structures. The material should be cleaned from the influent structure on a daily basis if necessary to prevent damage to the cominutor and entry into the lagoons. The source of the rock and gravel should be determined and the problem corrected to prevent clogging of sewer lines and inflow and infiltration (I/I) of extraneous water into the system.
4. Electrical power has been cut off to the influent flow meter and it is no longer in working order. The wiring, conduit, and flow meter components are severely corroded and would have to be replaced if influent flow measurement is to be provided.
5. The barscreen is badly corroded and needs replacement. The cominutor is working, but is rusted and needs reconditioning to prevent further damage from corrosion.
6. The laboratory building and counter where laboratory analysis equipment and meters are used was found to be very dirty. The meters and supplies used for analysis should be maintained under clean conditions to assure the quality of the self-monitoring data.
7. Herbicide has been used on the inside of the lagoon embankments. This has resulted in bare soil and erosion in much of the area at and just above the water level in both lagoons. There is an area of particular concern where the banks are eroded around the pipe leading from the second lagoon to the chlorine contact chamber. Keeping trees and deep rooted woody vegetation from growing on the banks or inside the lagoons to prevent root damage to the lagoon liner is an appropriate maintenance practice. However, erosion can be a particular problem in aerated lagoons due to the "wave action" from the aerated wastewater. Some means should be found to stabilize against erosion to prevent damage to the lagoon embankments.
8. Chlorine bleach solution has been used for effluent disinfection for an extended period of time. However, two chlorine gas cylinders, believed empty, are still stored in the chlorine feed room. The cylinders pose a safety hazard. The supply company should be contacted to arrange removal from the facility. The chlorine room was not locked. Danny Baggett did not know if there was a vent fan or a key for the chlorine room. Although not as hazardous as chlorine gas, the bleach solution can still produce vapors that might build up in the room. Without ventilation this could pose a safety hazard to anyone who enters. I located the vent fan switch and the fan was working. The fan should be run for several minutes before anyone enters the room. The chlorine room should be kept locked, and anyone working at the facility should be trained in safety procedures for working with and around the chlorine. The light for the room wasn't working, this should also be remedied.
9. Although the chlorine contact chamber was reported to have been cleaned about three months ago, it was very dark and appeared to contain accumulated solids. During

cleaning, the drain valve in the bottom of the chamber is opened, allowing the wastewater to drain out the discharge line to the river. The walls of the chamber are scraped down, the remaining solids (two to three inches deep) are shoveled into a 5 gallon bucket, then taken to the Erin wastewater plant for disposal. The chamber is then washed down with water and the valve closed. This procedure would allow solids to be discharged from the system and is not compliant with permit conditions. When cleaning the chamber the drain valve should not be opened. The wastewater should be pumped back into the first lagoon, any remaining solids removed, and then flow restored to the chamber.

10. There have been continued problems with duckweed covering the surface of the lagoons. This has not caused a problem regarding treatment and has not caused clogging of any structures. The only other potential problem would be if any die off of the plants during the winter were to cause elevated levels of BOD or suspended solids in the effluent discharge due to the added plant material. Metal bars or a large mesh screen could be placed over the opening to the lagoon outfall line if there are continued concerns about a large turtle getting caught and blocking the line again. The presence of turtles in lagoons is common and does not usually cause any operational problems.
11. A double faced sign is posted adjacent to the outfall point at the river to advise the public or the location and nature of the wastewater discharge. However, the division phone number is not included on either sign. This information should be added to the signs. A separate section can be added without replacing the signs. The signs were partly obscured by tree trunks or limbs, particularly on the river side. The sign location should be moved to clear the tree trunks, and the limbs kept trimmed to allow visibility when approaching from both the river and the bank.

Flow Measurement, Sampling, and Laboratory Analysis

1. The current NPDES permit requires influent flow measurement. The facility has only effluent flow measurement available. Effluent flow measurement is necessary to calculate daily maximum, weekly average, and monthly average pounds per day. The permit may be modified to make the change from influent flow measurement to effluent flow measurement.
2. Effluent flow meter calibration was conducted by Labtronx, in May of 2011. The company also calibrated the meters used for analysis of DO, pH, and chlorine residual. This meets the requirement for annual calibration by an outside service company for all meters and instruments used for self-monitoring purposes.
3. The operators do not conduct any calibration checks of the effluent flow meter in between annual service company calibrations. A staff gauge can be installed on the wall of the chlorine contact chamber at the flow meter sensor point so that a direct measurement of water depth is obtained. A direct measurement of water depth can be taken at the same time a flow meter reading is taken, and the flow calculated using a chart prepared specifically for that type effluent weir. The flow meter reading should then be

compared to the direct measurement flow reading, with the direct measurement considered the standard. The flow meter readings must be maintained within 10 percent plus or minus of the direct measurement reading. The calibration checks by the operators should be conducted once per month and records maintained of the information. If the meter readings are outside that range, the service company should be called to check and adjust calibration.

4. The effluent primary flow device is a 22.5 degree V-notch weir installed in the chlorine contact chamber just before the flow exits the plant into the outfall line. An ultrasonic sensor and flow meter are used to obtain the electronic flow readings and serves as the secondary flow measurement device. This size of v-notch weir is not suited to the extremely high flow levels which are occurring during rain events. Even considering the I/I problems, the widely fluctuating averages and minimum flow measurements contained in the attached 2011 effluent flow summary table indicate there are problems with the accuracy of the flow data. Average daily flow ranges from 750 to 66,666 gallons per day were reported. Minimum daily flow ranges from 20 (twenty) to 1,100 gallons per day. Mr. Baggett explained that on many days the lagoon gets very little flow due low water usage and the pump station arrangement of successive discharge from one station to another. Despite the meter calibration by the service company, problems with the accuracy of flow meter readings can develop at any time. Also, the flow monitoring devices for this system were not designed to handle flow rates so far beyond the design capacity of the treatment lagoon. The weir, flow meter and sensor should be evaluated to see if there are problems, or if other flow devices are needed to accurately measure the widely fluctuating flow levels experienced at the lagoon.
5. The reagents and standards used for laboratory analysis must be stored within a controlled temperature range. The meters used for analysis also must be protected from temperature extremes. The air conditioner for the laboratory building has been out of service for an extended period of time, including the summer months. Both air conditioning and heat must be provided wherever the reagents and meters are stored.
6. Mr. Perrigo collects grab samples for effluent settleable solids, dissolved oxygen (DO), pH, and total residual chlorine and conducts the analysis. He explained that Danny Baggett collects the samples and conducts these analyses in his absence. The instruments and equipment to conduct the analysis for these parameters are kept on site at the lagoon control building. Analysis results for DO and total residual chlorine are reported five times per week as required. However, analysis results for settleable solids and pH are only reported twice per week. The current permit requires that sampling and analysis be conducted at a frequency of five times per week for pH and settleable solids. The city may request a modification of the permit requirements to reduce the frequency of analysis for these two parameters. The request for modification should be in the form of a written request that provides the justification for the change.

7. Ricky Eads, the certified operator for the Erin wastewater treatment plant, collects the samples once per week for effluent biochemical oxygen demand (BOD), total suspended solids, and E. coli; and for influent BOD. This meets the frequency required in the permit. Although not required by the permit, sampling and analysis is also conducted for influent total suspended solids. Effluent BOD samples are collected at the end of the pipe leading from the lagoon to the chlorine contact chamber, just prior to chlorination. The E. coli and total suspended solids samples are collected at the effluent weir. All the samples are placed on ice in a cooler for transport to the Erin wastewater plant laboratory.
8. All the parameters are collected as grab samples. However, the permit requires the use of proportional to flow composite samples for BOD and suspended solids. The facility does not have proportional to flow composite samplers. Samples may be manually collected (minimum of 8 per 24 hours) and mixed proportional to flow (using flow data readings) if the samples are maintained at 0 to 6°C during the collection period. Either method would require the use of an influent flow meter for the influent BOD samples. The city may request a modification of the permit to change from proportion to flow composite samples to grab samples for these parameters. The request for modification should be in the form of a written request that provides the justification for the change.
9. All the BOD, total suspended solids and E. coli analyses are conducted at the City of Erin wastewater treatment plant laboratory by Ricky Eads. A compliance sampling inspection was recently conducted at the Erin wastewater treatment plant. Various violations and deficiencies were found regarding the analysis procedures for some parameters which would affect the accuracy and reliability of the analysis results. A copy of the inspection report is enclosed. It is my understanding that corrective measures are being initiated to remedy some of these problems.

Dissolved oxygen (DO)

1. A YSI 5000 meter is used for dissolved oxygen analysis. The probe is stored in a BOD bottle containing a small volume of water, and appeared to be in good condition.
2. The manufacturer's procedures are used for calibration of the meter. Calibration must be conducted each day when DO analysis is run.

pH

1. A Hach SensIon I, with a gel type probe is used for analysis of pH. The probe appeared to be in good condition, and was stored in a closed bottle of manufacturer's prepared storage solution. The bottle of additional probe storage solution had an expiration date of May 2010, should be discarded, and new storage solution purchased.
2. All the pH standards on hand at the lab (pH 7 = August 2004, pH 4 = January 06) had exceeded the expiration dates except for one bottle of pH 4 solution with an expiration date of May 2012. Storage without air conditioning in the lab building during the heat of the summer months would cause the stability of this standard to be questionable because it would have exceeded the maximum storage range temperatures. Mr. Perrigo advised later that he kept other bottles of pH standards in the shop office building where air

conditioning was available. The caps to the bottles in the lab were not closed tightly. This can lead to evaporation or contamination of the solution, causing erroneous readings. The old expired standards should be discarded along with the portions of standards kept in small unlabeled containers. A fresh portion of standards must be used for calibration of the meter prior to analysis on each day that analysis is conducted.

Total Residual Chlorine

1. A Hach Pocket Colorimeter II is used for conducting the total chlorine residual analysis. The inside of the case where the meter and vials are stored was very dirty with accumulated particles of dirt and other material, and the vials used for the analysis appeared dirty and in need of cleaning. The analysis procedure is dependent on light transmittance. The vials, meter, and storage case should be kept clean to prevent dust, dirt and other materials from interfering with the analysis by coating or scratching the surface of the vials, or getting into the vial chamber inside the meter. After filling the vials with the sample, the outside of the vials should be wiped down with a Chemwipe, or other brand tissues designed for glassware cleaning, to remove water droplets, dirt, and fingerprints before placing in the meter chamber.
2. Calibration standards are not used to check meter calibration. This analysis requires the use of secondary standards to check meter calibration each time the meter is used for the self-monitoring analysis. Written information explaining this procedure has been provided to city personnel. This calibration would be different from any meter calibration conducted for the drinking water system analysis for free chlorine residual.
3. There were two sealed (unopened) plastic bags containing DPD reagent packets in the laboratory building with an expiration date of January 2013. The DPD powdered reagent is labeled for storage between 10 and 25° degrees C (50 to 77° F). These storage conditions have not been met. Not maintaining reagents at the required temperatures can cause the analysis results to be inaccurate and unreliable.
4. The analysis method used was described as follows: before analysis of the samples, the meter is zeroed out using a blank (a vial of wastewater sample). The analysis is then conducted by placing the contents of a powdered DPD reagent packet into the sample and shaking it up, immediately followed by placing the vial in the meter and taking the total chlorine residual reading. For this analysis, the manufacturer's instructions and EPA Approved Methods of analysis require that the color of the sample be allowed to develop for three to six minutes before placing the vial in the meter to obtain the analysis reading. All the previous analysis results obtained without meter calibration and using the incorrect procedure would be considered invalid for self-monitoring purposes.

Settleable Solids

1. The bottom of the Imhoff cone used for this analysis was found to contain a large amount of material which contained lint, spider webs, dead bugs and dust that had accumulated over time. The accumulated material had reached a point above the level of the 1.0 ml/L mark, which is the permit effluent limit. Thus far during 2011, all analysis results for

settleable solids have been reported on the MORs as less than 0.1 ml/L. In order to accurately obtain the lower readings in tenths of a milliliter, the cone must be clean when the analysis is started. The Imhoff cone should be cleaned after each use in order to prevent accumulated solids from interfering with analysis readings which must be obtained by reading the graduated markings on the side of the glass cone.

2. The analysis method used at the time of the inspection was to pour the sample into the Imhoff cone, but to only allow the sample to settle for three to four minutes. The appropriate EPA Approved analysis procedure includes shaking the sample to mix and suspend the solids in the container, pouring 1000 ml of sample into the cone, allowing settling for 45 minutes, followed by passing a glass stirring rod very slowly around the inside edge of the cone to dislodge any solids clinging to the glass, and then allowing another 15 minutes of settling before the reading is taken from the markings on the cone. All the previous analysis results obtained using the incorrect procedure would be considered invalid for self-monitoring purposes.

The EPA Approved Methods of analysis for DO, pH, total chlorine residual, and settleable solids should be reviewed and discussed with the certified operator in order to assure the analysis are conducted and reported properly.

Records and Reports

1. A copy of the cover page for the current permit (effective July 1, 2010) was posted in the lagoon control building, along with two pages showing the effluent limits and sampling frequency from the previous, expired permit. A copy of the permit was not found in the records in the office or at the plant during the inspection. The entire permit should be kept on hand at the lagoon for reference regarding compliance requirements, and city personnel should become familiar with those requirements.
2. Part of the monthly operation reports (MORs) and discharge monitoring reports (DMRs) for the preceding three years were found in the files at the shop office. The wastewater reports were mixed with the water system records and were very difficult to locate. Separating the wastewater and water system records and better organization of the files would be helpful. All the records related to the wastewater system must be maintained on file for a minimum of three years.
3. The results from analysis conducted by Mr. Perrigo are recorded directly onto the MOR form and no daily records (worksheets) are kept to document date and time of sample collection, meter calibration, date and time of analysis, who conducted the analysis or the analysis result. The permit requires that records be kept of the date and time of sample collection and analysis, person conducting analysis, and the analysis result. Records documenting calibration for the laboratory meters and instruments are also required. Copies of example worksheets have been provided to the system personnel.

4. No records are maintained at Cumberland City of the results from analysis conducted at the Erin wastewater laboratory, other than the MORs. Copies of worksheets and analysis results for data from the Erin lab should be obtained and kept on file at Cumberland City.
5. After the results for DO, pH, total residual chlorine, and settleable solids are recorded on the MOR, it is then given to the certified operator, Mr. Baggett, to fill in the results from analysis conducted at the Erin wastewater laboratory. He also completes the MOR (totals/average/maximum/minimum/pounds per day, etc.) and fills out the DMR which is a summary of data from the MOR. He then signs the MOR, and the MOR and DMR are given to Mr. Perrigo. The mayor then signs the DMRs, and Mr. Perrigo makes copies and mails both reports to the division's central office at 401 Church Street, Nashville.
6. The field office had not received any MORs since March of 2010. The original MORs should be mailed to the following address:

Division of Water Pollution Control
Nashville Environmental Field Office
711 R. S. Gass Blvd.
Nashville, TN 37216

A year's supply of blank MOR forms was provided during the inspection. The MOR for September was recently received in our office.

7. The central office location at 401 Church Street is the correct address for sending the DMRs.
8. The BOD percent removal and pounds per day data is reported on the DMRs, but is not recorded on the MORs. This information should be provided on both reports. The monthly average flow is not calculated properly on some MORs. The number of days when flow data is recorded should be used to average the data, not the total number of days in the month.
9. A review of the copies of the MORs and DMRs forwarded from our central office revealed no violations of permit effluent limits reported. However, considering the problems found with the accuracy and reliability of the laboratory analysis data for various parameters, some of this self-monitoring data could not be used to determine compliance with the permit limits.

Additional effort is needed to coordinate operation and self-monitoring responsibilities between the various people who are working within the wastewater system. More supervision and direct involvement is needed from the certified wastewater facility operator to insure that all the permit compliance requirements are understood and are met. Additional training is needed for the city personnel involved in self-monitoring and operation of the system. Since the inspection, Phillip Baggett has begun working with the city personnel to review these procedures.

Ann Rochelle

